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Krivec

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[54] **LINEAR OPENING BOOSTER CLAMP**

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[51] **Int. Cl.**[6] **H01R 4/48**

[52] **U.S. Cl.** **439/759**; 439/482

[58] **Field of Search** 439/504, 506, 439/726, 729, 755, 759, 482; 324/555, 556; 219/143

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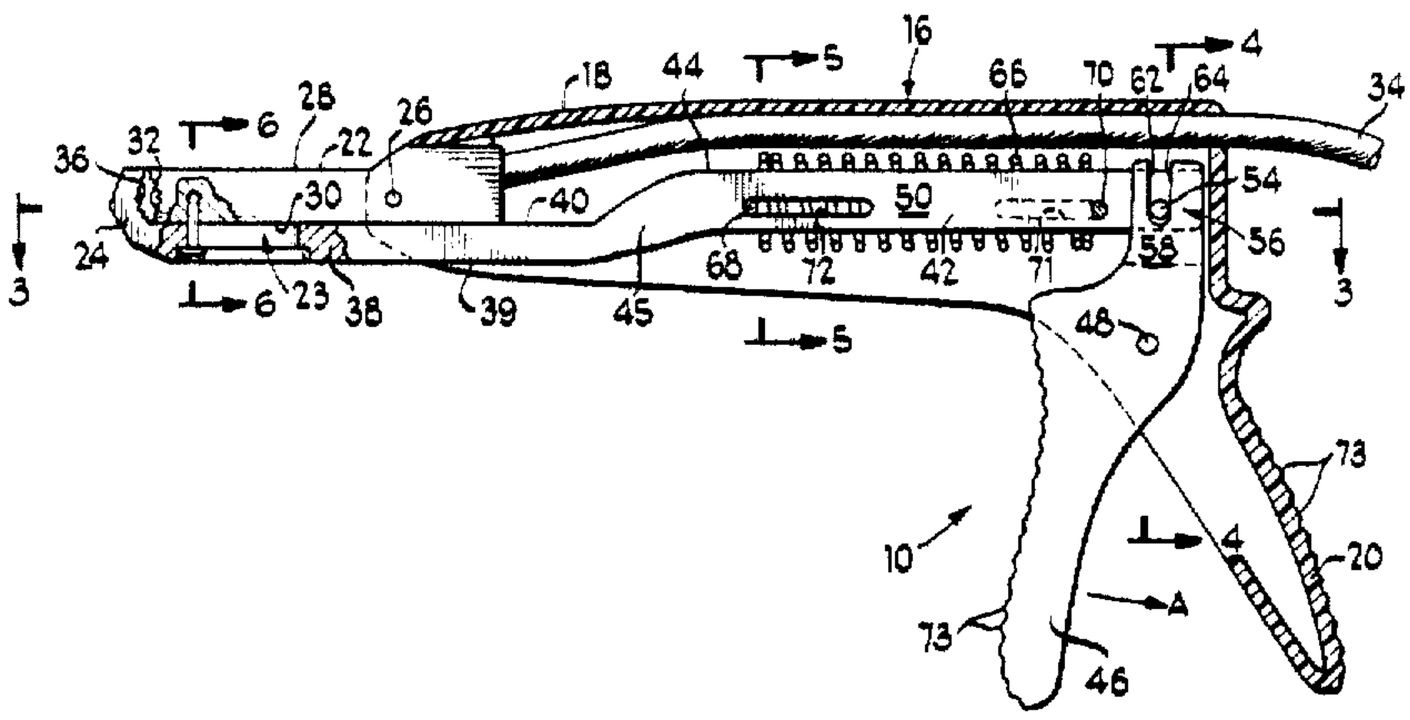
[57] **ABSTRACT**

A linear clamp for releasably engaging an electrical connector is provided. The clamp includes a housing having a hand grip portion and an elongated barrel portion having a longitudinal axis, a fixed jaw carried by the barrel portion, and a moveable member having a moveable jaw thereon axially aligned with and facing the fixed jaw, wherein the longitudinal axis passes through the jaws. The clamp further includes resilient means for urging the moveable jaw toward the fixed jaw, and a lever pivotally connected to the hand grip portion and coupled to the moveable member for linearly moving the moveable jaw along the longitudinal axis away from the fixed jaw.

15 Claims, 2 Drawing Sheets



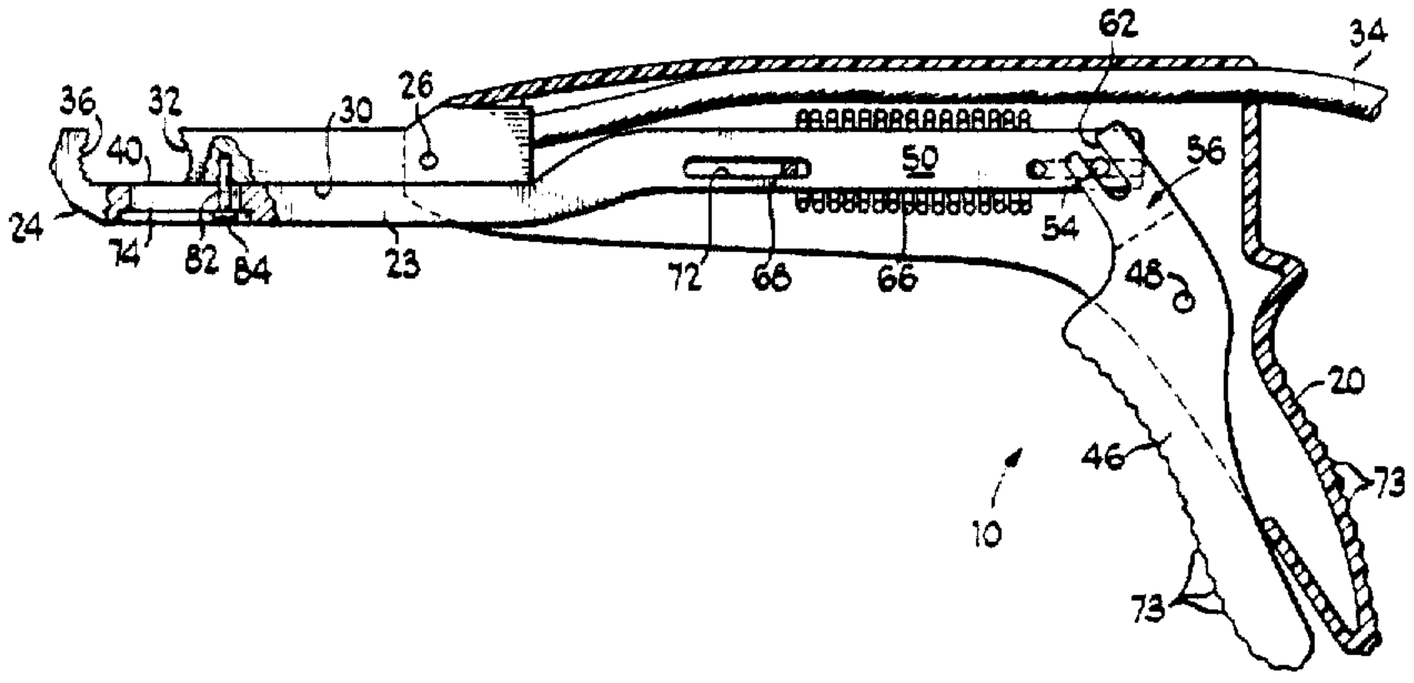


Fig 1

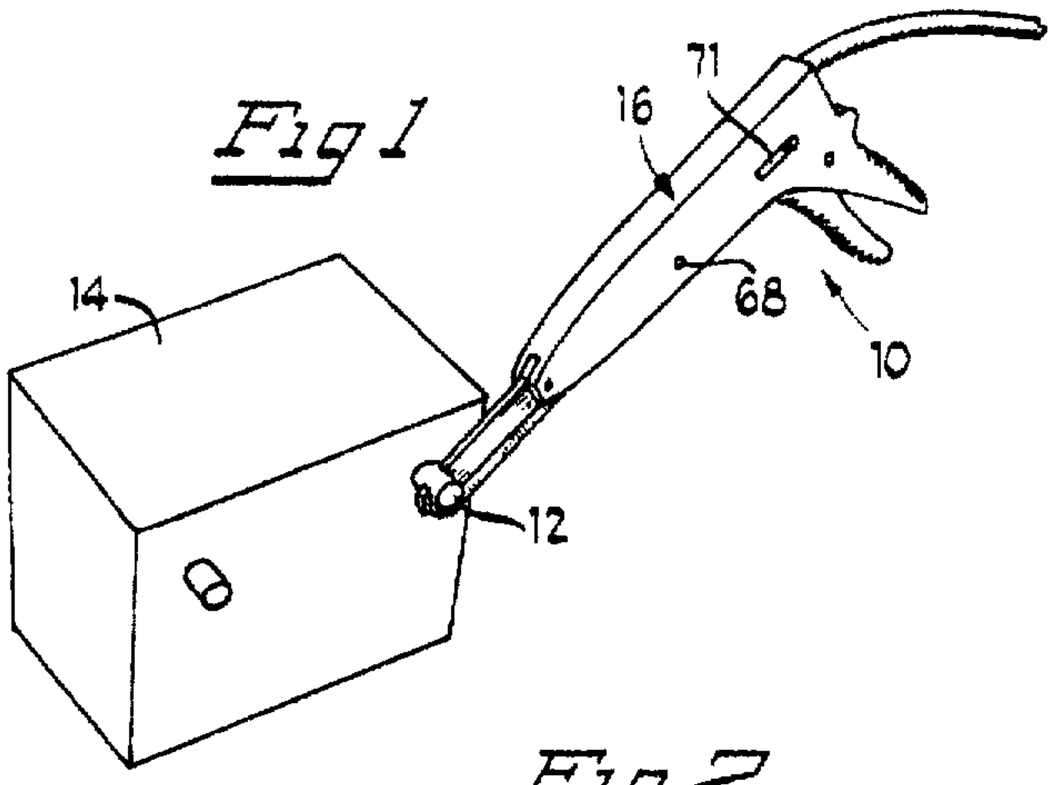


Fig 4

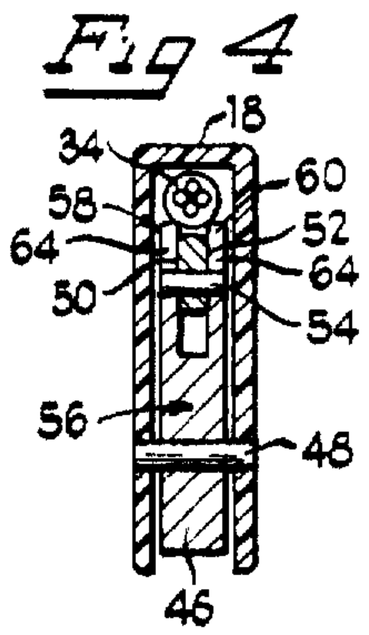


Fig 2

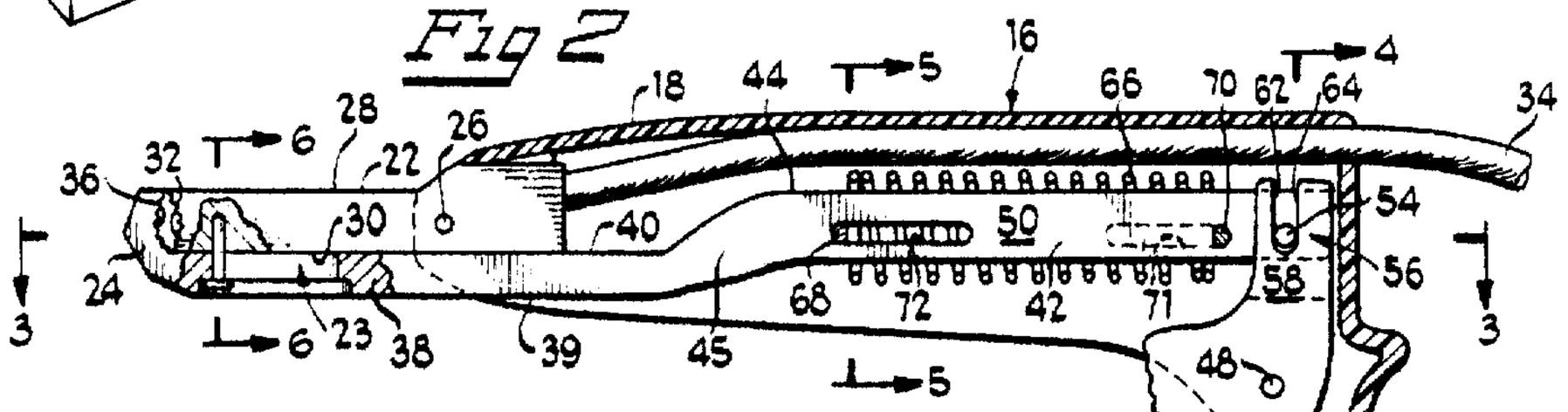


Fig 6

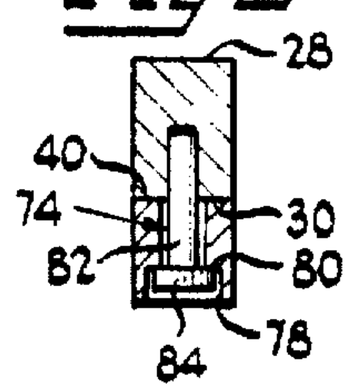


Fig 5

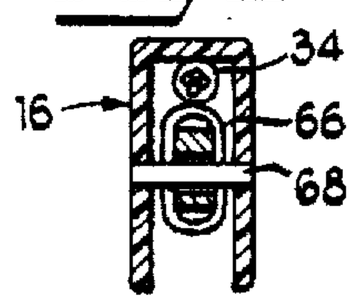


Fig 3

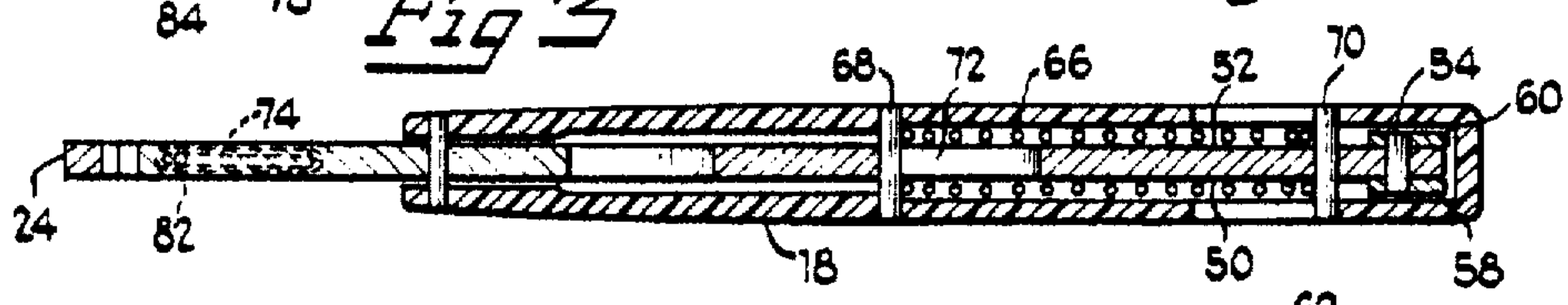
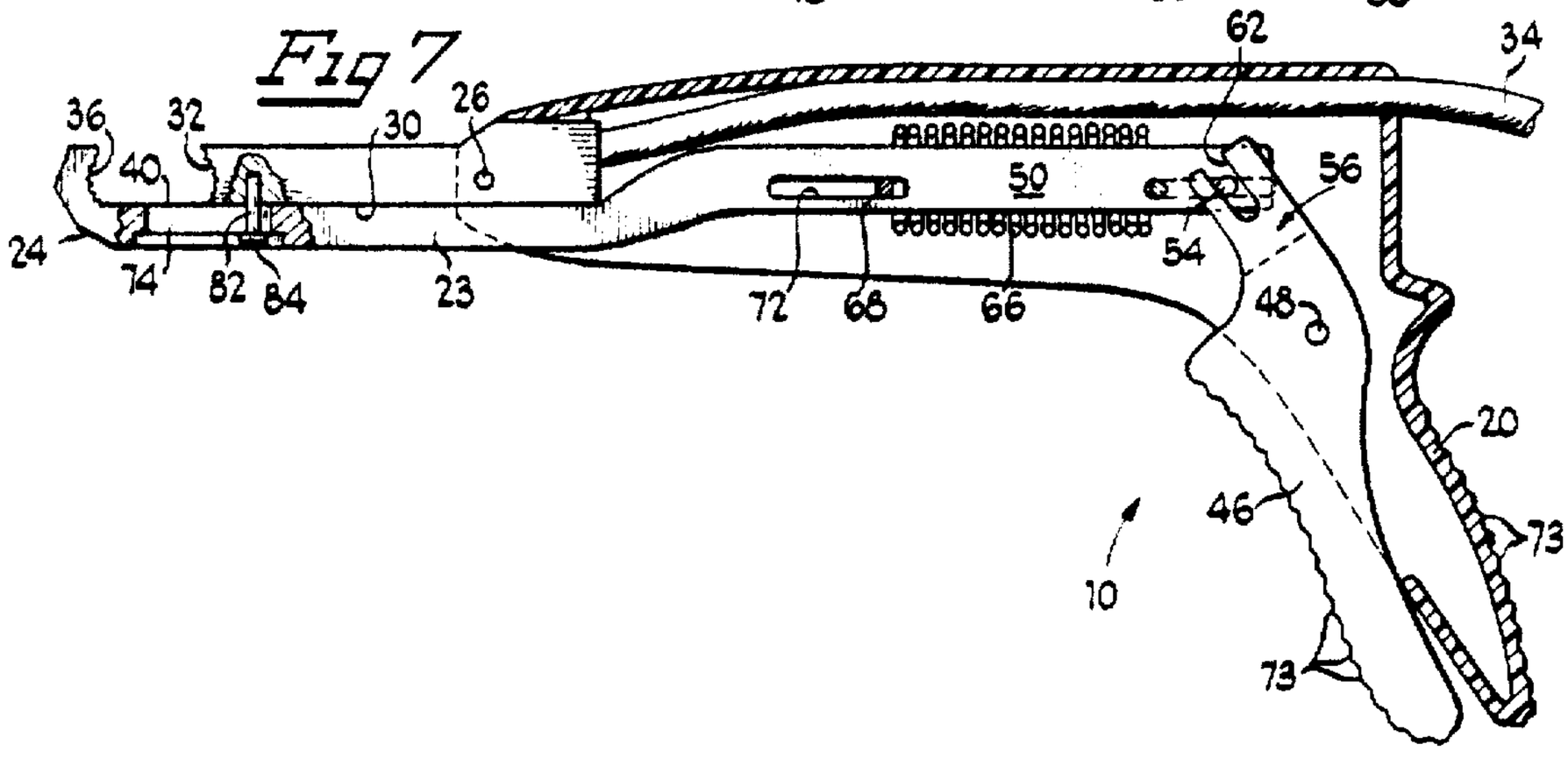


Fig 7



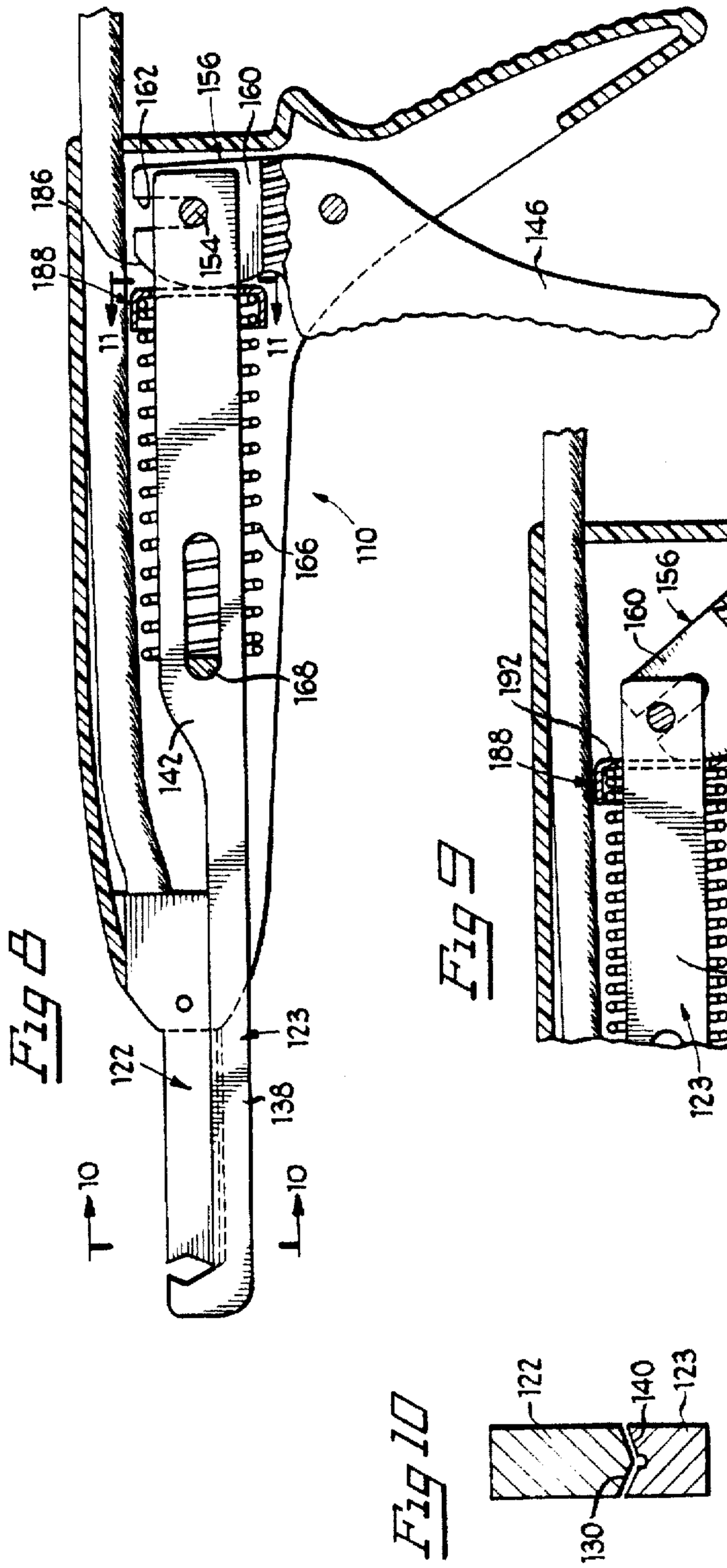


Fig 8

Fig 9

Fig 11

Fig 10

LINEAR OPENING BOOSTER CLAMP

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to battery or booster clamps and more particularly to clamps which have jaw portions which open linearly with respect to each other.

2. Description of the Prior Art

Conventional pivotally opening battery or booster clamps typically have two levers, a jaw portion attached to each lever for clamping onto a battery electrode and a joint comprised of a helical spring disposed about a rivet which pivotally connects the two levers of the booster clamp. The spring is adapted to bias the jaw portions of the clamp together to maintain the clamp in a closed position. The clamp is opened by manually squeezing the two levers toward one another to separate the jaw portions.

Though this type of clamp is widely used, it has severe limitations. It is very difficult to use in tightly cramped quarters. This is of special concern since many cars today are mid-size or smaller and have very little work space under the hood and often have batteries equipped with side terminals in close proximity to a fender. Users of these conventional pivoted lever clamps, therefore, often have trouble reaching the terminal of a battery to attach the booster clamp and have to attach the clamp in a very slow and careful process so that the clamp does not contact conductive portions of the car to make an unwanted electrical contact.

SUMMARY OF THE INVENTION

It is a general object of the invention to provide a booster clamp which avoids the disadvantages of prior clamps while affording additional structural and operating advantages.

An important feature of the present invention is the provision of a booster clamp which can be operated quickly and effectively in cramped quarters.

Another feature of the present invention is the provision of a booster clamp having the ability to clamp onto a connection previously unreachable with a conventional clamp.

Another feature of the present invention is the provision of a booster clamp which is of simple and economical construction.

These and other features of the present invention are attained by providing a linear clamp for releasably engaging an electrical connector. The linear clamp including a housing having a hand grip portion and an elongated barrel portion having a longitudinal axis, a fixed jaw carried by the barrel portion, and a moveable member having a moveable jaw thereon axially aligned with and facing the fixed jaw, wherein the longitudinal axis passes through the jaws. The clamp further includes resilient means for urging the moveable jaw toward the fixed jaw, and a lever pivotally connected to the hand grip portion and coupled to the moveable member for linearly moving the moveable jaw along the longitudinal axis away from the fixed jaw.

The invention consists of certain novel features and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the details may be made without departing from the spirit, or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawings

a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, the invention, its construction and operation, and many of its advantages should be readily understood and appreciated.

FIG. **1** is a perspective view of a linear booster clamp of the present invention in electrical contact with a side terminal of a battery;

FIG. **2** is an enlarged sectional view of the clamp of FIG. **1** in its normal closed condition, having portions broken away for clarity;

FIG. **3** is a sectional view taken generally along the line **3—3** in FIG. **2**;

FIG. **4** is a sectional view taken generally along the line **4—4** in FIG. **2**;

FIG. **5** is a sectional view taken generally along the line **5—5** in FIG. **2**;

FIG. **6** is a sectional view taken generally along the line **6—6** in FIG. **2**;

FIG. **7** is a view similar to FIG. **2** illustrating the clamp of FIG. **1**, in an open position;

FIG. **8** is a further enlarged sectional view, similar to FIG. **2**, illustrating an alternative embodiment of the clamp of the present invention;

FIG. **9** is a fragmentary sectional view illustrating portions of the clamp of FIG. **8** in an open position;

FIG. **10** is a still further enlarged sectional view taken generally along the line **10—10** in FIG. **8**; and

FIG. **11** is a further enlarged sectional view taken generally along the line **11—11** in FIG. **8**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, a linear booster clamp **10** is illustrated attached to a side terminal **12** of a battery **14**. As best seen in FIGS. **1** and **2**, the linear booster clamp **10** includes a housing **16** having an elongated barrel portion **18** and a hand grip **20**.

The linear booster clamp **10** further includes a fixed jaw **22** and a moveable member **23** having a moveable jaw **24**. Both the fixed jaw **22** and moveable jaw **24** are comprised of an electrically conducting material such as steel or copper. The fixed jaw **22** is non-moveable relative to the housing **16** and is connected by a pin **26** (or any conventional means) to the barrel portion **18** of the housing **16**. The fixed jaw **22** is a straight bar having a top surface **28** and a bottom surface **30** and a first contact surface **32** for making electrical contact with a connector such as a battery electrode. The fixed jaw **22** is also electrically connected to a cable **34** by any conventional means.

The moveable jaw **24** is moveable, as discussed below, with respect to the fixed jaw **22**. The moveable jaw **24** includes a second contact surface **36** which faces and is opposite the first contact surface **32** of fixed jaw **22**. Together, the first and second contact surfaces **32**, **36** are adapted to form an electrical connection with an electric connector by clamping engagement therewith.

The moveable member **23** has a first portion **38** which has a bottom surface **39** and a top surface **40** which is disposed below and in slidable contact with the bottom surface **30** of the fixed jaw **22** and a second portion **42** which has a top surface **44** disposed above the bottom surface **30** of the fixed jaw **22**. An inclined portion **45** joins the portions **38** and **42**. The linear booster clamp **10** has a longitudinal axis, sub-

stantially parallel to the first and second portions **38** and **42** of the moveable member **23**, which passes through barrel portion **18**, first contact surface **32** of the fixed jaw **22** and second contact surface **36** of the moveable jaw **24**. As discussed below, the second contact surface **36** of the moveable jaw **24** moves linearly along this axis when the clamp **10** is opened and closed. The moveable jaw **24** is disposed at a greater distance along the longitudinal axis from the hand grip **20** than the fixed jaw **22**.

The linear booster clamp **10** further includes a lever **46** (or trigger) which is pivotally connected by a pin **48** to the hand grip **20** of the housing **16**. To prevent unwanted electrical connections, the housing **16** and lever **46** are ideally made out of a hard plastic but may be formed of any suitable non-conductive material.

As best seen in FIGS. **2** and **4**, the moveable member **23** has two side surfaces **50**, **52** and a bearing pin **54** which passes through the second portion **42** of the moveable member **23** and is substantially normal to the longitudinal axis. The lever **46** has a clevis-shaped first end **56** receiving the rear end of moveable member **23**. The first end **56** of the lever **46** has a first wall **58** adjacent side surface **50** and a second wall **60** adjacent side surface **52**. The first and second walls **58**, **60** are separated by a distance slightly greater than the distance between the side surfaces **50**, **52** of the moveable member **23**. Each of the first and second walls **58**, **60** has an open ended slot **62**, the slots **62** respectively receiving opposite ends of the bearing pin **54**. Each slot **62** also has a bearing surface **64**, as discussed below.

Normally, as seen in FIG. **2**, the moveable jaw **24** is biased toward the fixed jaw **22** to maintain the clamp **10** in a closed or clamped position. This biasing is accomplished by having a helical compression spring **66** disposed about the second portion **42** of the moveable member **23**. As best seen in FIGS. **2** and **5**, one end of the spring **66** bears against a flat-sided pin **68** which is substantially normal to the longitudinal axis and attached to the barrel portion **18** of the housing **16**. The other end of the spring **66** bears against a pin **70** disposed substantially normal to the longitudinal axis and extending from the side surfaces **50**, **52** of the second portion **42** of the moveable member **23** through a pair of slots **71** disposed in the barrel portion **18** of the housing **16**. The second portion **42** also includes a slot **72** running substantially parallel to the longitudinal axis and receiving the pin **68** therethrough. Slots **71** and **72** permit the moveable member **23** to move linearly along the longitudinal axis without any interference from the pins **68** and **70**.

The lever **46** and the hand grip **20** are configured to have a pistol-grip action. A user places his palm against the hand grip **20** and, using the fingers of the same hand, squeezes the lever **46** or "trigger" towards the grip **20** to open the linear booster clamp **10**. The lever **46** and the hand grip **20** may have a plurality of ridges **73**, which provide the user with a better grip.

To open the linear booster clamp **10**, lever **46** is manually moved, as just described, in the direction of arrow A in FIG. **2**, towards the hand grip **20**. Bearing surface **64** of the first and second walls **58**, **60** bear on the bearing pin **54** to linearly push the moveable member **23** and the second contact surface **36** of the moveable jaw **24** along the longitudinal axis and away from the first contact surface **32**, compressing spring **66**, as seen in FIG. **7**. The lever **46** is so configured that the force necessary to squeeze the lever **46** toward the hand grip **20** to compress spring **66** and open the linear booster clamp **10** is smaller than the force exerted by the spring **66** to bias the moveable jaw **24** toward the fixed jaw **22**.

Additionally, the linear booster clamp **10** provides means to keep the first and second contact surfaces **32**, **36** of the fixed and moveable jaws **22**, **24** axially aligned, so that the moveable member **23** and its moveable jaw **24** move substantially only parallel to the longitudinal axis. This alignment allows the linear booster clamp **10** to easily and efficiently clamp onto an electrical connector.

The alignment means include the slot **72** and pin **68** which prevent the moveable jaw **24** from moving vertically with respect to fixed jaw **22**, so that the top surface **40** of the first portion **38** remains in slidable contact with the bottom surface **30** of the fixed jaw **22**.

Additionally, the first portion **38** of the moveable member **23** includes a slot **74** which passes through the top and bottom surfaces **40**, **39**. The slot **74** has a countersunk portion **78** in the bottom surface **39** such that an peripheral shoulder **80** is formed (see FIG. **6**). A pin **82** extends through the slot **74** and is fixed to the fixed jaw **22**, the pin **82** having an enlarged head **84** receivable in the countersunk portion **78** against the peripheral shoulder **80** to prevent the moveable member **23** from moving horizontally or vertically relative to the longitudinal axis, thereby to keep the first and second contact surfaces **32**, **36** of the fixed and moveable jaws **22**, **24** axially aligned.

An alternative linear booster clamp **110** is illustrated in FIGS. **8–11** which is identical to the linear booster clamp **10** illustrated in FIGS. **1–7** except as described below.

First, the linear booster clamp **110** is biased toward a closed position in a slightly different manner. Lever **146** has a clevis-shaped first end **156** having separated walls **158**, **160** each having an arcuate bearing surface **186**. Helical spring **166** is disposed about the second portion **142** of moveable member **123** and has the rear end thereof seated in a cap **188**. Cap **188** has a rectangular aperture **190** therein, through which the second portion **142** of moveable member **123** passes, and a bearing surface **192**. The forward end of spring **166** bears against flat-sided pin **168** and cap **188** bears against arcuate surfaces **186** of the walls **158**, **160** of the lever **146** which, in turn, act on the moveable member **123** through the pin **154** in open slots **162**.

Linear booster clamp **110** also includes slightly different alignment means to allow the moveable member **123** to move substantially only along the longitudinal axis. As best seen in FIG. **10**, the bottom surface **130** of fixed jaw **122** and the top surface **140** of the first portion **138** of moveable member **123** are both non-planar and each have a mateable, non-linear, generally V-shaped, transverse cross-sectional shape which together prevent the moveable member **123** from moving horizontally with respect to the longitudinal axis. While FIG. **10** illustrates the bottom surface **130** with a male V-shape and the top surface **140** with a female V-shape, these surfaces **130**, **140** can have any other mateable non-linear cross-sectional shapes that together prevent non-linear movement of the moveable member **123**.

While particular embodiments of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes and modifications may be made without departing from the invention in its broader aspects. Therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only and not as a limitation. The actual scope of the invention is intended to be defined in the following claims when viewed in their proper perspective based on the prior art.

I claim:

1. A battery clamp for releasably engaging a battery terminal comprising:

a housing having a hand grip portion engageable with the palm of a user's hand and an elongated barrel portion having a longitudinal axis;

a fixed jaw carried by the barrel portion;

a moveable member having a moveable jaw thereon axially aligned with and facing the fixed jaw, wherein the longitudinal axis passes through the jaws;

resilient means for urging the moveable jaw toward the fixed jaw; and

a lever engageable with the fingers of the user's hand pivotally connected to the hand grip portion and coupled to the moveable member for linearly moving the moveable jaw along the longitudinal axis away from the fixed jaw, the lever and the hand grip forming a pistol grip configuration.

2. The clamp of claim 1, wherein the distance along the longitudinal axis between the moveable jaw and the grip portion is greater than the distance between the fixed jaw and the grip portion.

3. The clamp of claim 1, wherein the moveable member has first and second ends and wherein the moveable jaw is disposed at the first end and the second end is disposed within the housing.

4. The clamp of claim 3, wherein the resilient means includes a helical spring disposed about the moveable member.

5. The clamp of claim 4, wherein the spring is a compression spring.

6. The clamp of claim 3, and further comprising a pin substantially normal to the longitudinal axis and extending from the moveable member and a slot disposed at a first end of the lever for receiving the pin.

7. The clamp of claim 1, and further comprising alignment means for preventing the moveable jaw from moving perpendicular to the longitudinal axis, whereby the fixed and moveable jaws are maintained in axial alignment.

8. The clamp of claim 7, wherein the fixed jaw includes a straight bar having a top surface and a bottom surface and wherein the moveable member includes a first portion having a top surface disposed below and in slidable contact with the bottom surface of the straight bar and a second portion having a top surface disposed above the bottom surface of the straight bar.

9. The clamp of claim 8, wherein the alignment means includes a slot disposed through the first portion of the moveable member and a pin disposed through the slot and connected to the straight bar.

10. The clamp of claim 8, wherein the alignment means includes the bottom surface of the straight bar having a transverse cross-sectional first non-linear shape and of the top surface of the first portion of the moveable member having a transverse cross-sectional second non-linear shape mateable with the first non-linear shape.

11. The clamp of claim 10, wherein the alignment means further includes a slot disposed through the moveable member and a first pin attached to the housing and substantially normal to the longitudinal axis.

12. The clamp of claim 11, wherein the lever includes a first end having an arcuate bearing surface and wherein the resilient means bears against the bearing surface and the first pin.

13. The clamp of claim 12 where the resilient means includes a cap and a helical compression spring disposed about the moveable member and having a portion disposed in the cap, wherein the cap bears against the bearing surface.

14. The clamp of claim 11, and further comprising a bearing pin disposed through and extending from the second portion of the moveable member, wherein the resilient means bears against the first pin and the bearing pin.

15. A battery clamp for releasably engaging a battery terminal comprising:

a housing having a hand grip portion engageable with the palm of a user's hand and an elongated barrel portion having a longitudinal axis;

a fixed jaw carried by the barrel portion;

a moveable member having a moveable jaw thereon axially aligned with and facing the fixed jaw, wherein the longitudinal axis passes through the jaws;

resilient means for urging the moveable jaw toward the fixed jaw; and

a lever pivotally connected to the hand grip portion and coupled to the moveable member for linearly moving the moveable jaw along the longitudinal axis away from the fixed jaw, the lever having a finger engaging end engageable with the fingers of the user's hand and an output end adjacent the resilient means and a mechanical advantage greater than one.

* * * * *